

SECTION I.—AEROLOGY.

SOLAR AND SKY RADIATION MEASUREMENTS DURING JUNE, 1918.

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[Dated: Washington, D. C., July 29, 1918.]

For a description of instrumental exposures, and an account of the methods of obtaining and reducing the measurements, the reader is referred to the REVIEW for January, 1918, 46:2.

The monthly means and departures from normal values given in Table 1 show that direct solar radiation averaged very close to its normal intensity at Santa Fe, N. Mex., above normal at Madison, Wis., and below normal at Washington, D. C., and Lincoln, Nebr. A noon intensity of 1.44 calories measured at Madison at noon of June 22 is the highest intensity ever measured at that station in June.

Table 3 shows an excess of radiation at Washington and Lincoln, and only an unimportant departure from the normal amount at Madison.

Skylight polarization measurements obtained on three days at Washington give a mean of 46 per cent with a maximum of 47 per cent. The latter is considerably below the average June maximum. Measurements on six days at Madison, Wis., give a mean of 63 per cent, with a maximum of 69 per cent on the 12th.

No solar radiation measurements were obtained during the solar eclipse of June 8 at any of the above stations, on account of poor sky conditions, except a series at Lincoln, Nebr., extending from 4:53 p. m. to 5:27 p. m., apparent solar time. These give a minimum of 0.088 calories at 5:03 p. m., at which time the sun's true altitude was 25.2°, and the air mass 2.34. The sun's disk was then about 0.9 eclipsed. At this time the Callendar recorder at the same station gave a vertical intensity for the total radiation from sun and sky of 0.075. Since the vertical component of the direct solar radiation measured at this time is only 0.037 calories, the diffuse sky radiation and the direct solar radiation received on a horizontal surface must have been about equal in amount.

A few cirrus and cumulus clouds were present, principally near the western horizon.

TABLE 1.—Solar radiation intensities during June, 1918.

[Gram-calories per minute per square centimeter of normal surface.]

Washington, D. C.

Date.	Sun's zenith distance.									
	0.0°	48.3°	60.0°	66.5°	70.7°	73.6°	75.7°	77.4°	78.7°	79.8°
	Air mass.									
	1.0	1.5	2.0	2.5	3.0	3.5	4.0	4.5	5.0	5.5
1918										
A. M.	cal.	cal.	cal.	cal.	cal.	cal.	cal.	cal.	cal.	cal.
June 1.....	1.12									
4.....	1.15	1.04	0.95	0.83	0.74	0.66	0.59	0.55		
5.....		0.76	0.68							
10.....			0.89	0.81	0.72					
15.....	1.42	1.13	1.01							
24.....	1.37	1.27	1.16							
27.....	1.11	1.01	0.91	0.83						
Monthly means.....	1.23	1.04	0.93	0.82	(0.73)	(0.66)	(0.59)	(0.55)		
Departure from 10-year normal.....	-0.05	-0.05	±0.00	-0.01	-0.08	-0.10	-0.08	-0.05		
P. M.										
June 1.....		0.89	0.70		0.50					
4.....		0.73	0.68							
12.....			0.91	0.80						
15.....		1.25	1.15	1.06	0.94	0.82	0.72			
19.....		1.17	1.03	0.89						
Monthly means.....		1.01	0.89	0.92	(0.72)	(0.82)	(0.72)			
Departure from 10-year normal.....		-0.07	-0.10	+0.01	-0.10	+0.08	+0.02			

TABLE 1.—Solar radiation intensities during June, 1918—Continued.

Madison, Wis.

Date.	Sun's zenith distance.									
	0.0°	48.3°	60.0°	66.5°	70.7°	73.6°	75.7°	77.4°	78.7°	79.8°
	Air mass.									
	1.0	1.5	2.0	2.5	3.0	3.5	4.0	4.5	5.0	5.5
1918										
A. M.	cal.	cal.	cal.	cal.	cal.	cal.	cal.	cal.	cal.	cal.
June 4.....		1.04								
7.....	1.46	1.35	1.26	1.17						
11.....	1.20	1.13								
12.....	1.41	1.33	1.22	1.16	1.11	1.06	1.00	0.95		
14.....	1.32	1.17								
15.....	1.35	1.28	1.20							
17.....	1.32									
21.....	1.37	1.22	1.08	0.96	0.84					
22.....	1.45	1.36	1.25	1.14	1.07	0.99	0.91			
Monthly means.....	1.36	1.24	1.20	1.11	1.01	(1.02)	(0.96)	(0.95)		
Departure from 8-year normal.....	+0.04	+0.03	+0.07	+0.05	+0.04	+0.09	+0.07	+0.13		
P. M.										
June 7.....		1.33								
12.....		1.28	1.18	1.10						
14.....		1.17								
17.....		1.18								
Monthly means.....		1.24	(1.18)	(1.10)						
Departure from 8-year normal.....		+0.08	+0.08	+0.09						

Lincoln, Nebr.

Date.	Sun's zenith distance.									
	0.0°	48.3°	60.0°	66.5°	70.7°	73.6°	75.7°	77.4°	78.7°	79.8°
	Air mass.									
	1.0	1.5	2.0	2.5	3.0	3.5	4.0	4.5	5.0	5.5
1918										
A. M.	cal.	cal.	cal.	cal.	cal.	cal.	cal.	cal.	cal.	cal.
June 1.....	1.28	1.20	1.12	0.99	0.90	0.83				
2.....	1.22	1.19	1.04		0.94	0.90				
3.....					0.80	0.71	0.62			
11.....	1.38	1.16	1.03	0.94	0.87	0.82				
12.....	1.34	1.23	1.08	1.02	0.95	0.85	0.78			
14.....	1.28									
15.....	1.30									
16.....	1.35	1.22	1.09	0.98						
17.....	1.35				0.82	0.68	0.62			
25.....		1.24		0.99	0.90					
26.....	1.36									
27.....	1.34									
Monthly means.....	1.32	1.21	1.07	0.98	0.88	0.80	0.67			
Departure from 3-year normal.....	-0.03	-0.06	-0.06	-0.06	-0.06	-0.06	-0.09			
P. M.										
June 3.....		1.15								
15.....		1.10	0.97	0.86	0.77	0.68	0.61			
16.....		1.23	1.10	0.99	0.91	0.83	0.76			
17.....		1.24	1.14	1.04	0.95	0.86				
25.....		1.36	1.12	0.99	0.93	0.86				
26.....		1.23	1.10	0.99	0.92	0.86	0.80			
27.....		1.22	1.11	1.03	0.97	0.91	0.84			
Monthly means.....		1.23	1.10	0.98	0.91	0.83	0.75			
Departure from 3-year normal.....		±0.00	-0.01	-0.02	-0.01	-0.03	-0.02			

Santa Fe, N. Mex.

Date.	Sun's zenith distance.									
	0.0°	48.3°	60.0°	66.5°	70.7°	73.6°	75.7°	77.4°	78.7°	79.8°
	Air mass.									
	1.0	1.5	2.0	2.5	3.0	3.5	4.0	4.5	5.0	5.5
1918										
A. M.	cal.	cal.	cal.	cal.	cal.	cal.	cal.	cal.	cal.	cal.
June 1.....		1.35	1.23				1.06	1.01		
5.....	1.38					0.96				
7.....		1.21	1.14	1.06	1.00	0.91	0.87	0.78		
10.....		1.35	1.25	1.18	1.12	1.04	0.96	0.86	0.83	
11.....	1.45	1.36	1.27	1.20	1.12	1.07	1.01	0.97	0.92	
12.....		1.26	1.18	1.10						
13.....					0.99	0.93	0.88			
14.....		1.32	1.21	1.14						
15.....		1.19	1.08	0.99						
24.....		1.31	1.22	1.14	1.09	1.01	0.92			
26.....	1.45	1.35	1.25							
27.....	1.47	1.39	1.31	1.24	1.15	1.07	1.00			
28.....	1.47	1.43	1.36	1.28	1.20	1.16				
29.....				1.07	1.05		0.95			
Monthly means.....	1.44	1.33	1.24	1.15	1.07	1.03	0.95	0.87	(0.88)	
Departure from 6-year normal.....	-0.02	+0.02	+0.01	±0.00	+0.01	±0.00	+0.01	-0.06		
P. M.										
June 26.....		1.36	1.22							
27.....		1.38		1.24	1.20					
28.....		1.39	1.30	1.23	1.19					
Monthly means.....		1.38	(1.26)	(1.24)	(1.20)					
Departure from 2-year normal.....		-0.01	-0.06	+0.01	+0.04					

TABLE 2.—Vapor pressures at pyrheliometric stations on days when solar radiation intensities were measured.

Washington, D. C.			Madison, Wis.			Lincoln, Nebr.			Santa Fe, N. Mex.		
Date.	8 a. m.	8 p. m.	Date.	8 a. m.	8 p. m.	Date.	8 a. m.	8 p. m.	Date.	8 a. m.	8 p. m.
1918.	mm.	mm.	1918.	mm.	mm.	1918.	mm.	mm.	1918.	mm.	mm.
June 1	20.57	22.00	June 4	10.97	12.68	June 1	10.21	12.68	June 1	3.81	3.30
4	10.59	11.38	7	6.02	6.50	2	10.59	15.11	5	5.79	5.58
5	14.10	14.60	11	13.13	9.47	3	15.65	14.10	7	5.79	8.48
10	11.38	13.61	12	8.81	9.14	11	12.08	7.29	10	8.18	9.14
12	16.20	10.21	14	11.81	9.33	12	10.97	8.48	11	7.04	4.95
15	9.83	9.14	15	7.57	12.68	14	12.68	17.96	12	5.56	7.04
19	9.14	7.04	17	10.21	7.04	15	17.37	15.11	13	7.29	6.76
24	6.27	8.81	21	7.29	9.47	16	13.13	11.81	14	7.29	5.79
27	10.59	12.24	22	4.75	7.57	17	20.57	11.38	15	6.27	4.95
						25	14.10	9.83	24	9.14	7.29
						26	15.65	9.14	26	7.87	4.95
						27	11.81	10.21	27	5.79	4.95
									28	4.57	5.56
									29	4.17	7.04

TABLE 3.—Daily totals and departures of solar and sky radiation during June, 1918.

[Gram-calories per square centimeter of horizontal surface.]

Day of month.	Daily totals.			Departures from normal.			Excess or deficiency since first of month.		
	Washing- ton.	Madison.	Lincoln.	Washing- ton.	Madison.	Lincoln.	Washing- ton.	Madison.	Lincoln.
1918.	cal.	cal.	cal.	cal.	cal.	cal.	cal.	cal.	cal.
June 1	603	649	675	110	171	148	110	171	148
2	548	685	676	56	204	144	166	375	202
3	469	254	693	-23	-230	157	143	145	449
4	660	514	497	169	27	-45	312	172	404
5	611	236	550	120	-255	3	432	-83	407
6	400	384	447	-92	-110	-104	340	-193	303
7	302	752	642	-191	255	87	140	62	390
8	696	573	669	202	72	110	351	134	500
9	724	538	606	229	34	43	580	168	543
10	629	410	669	133	-97	102	713	71	645
11	507	671	666	9	160	95	722	231	740
12	551	753	719	52	239	144	774	470	884
13	615	543	662	115	26	83	889	496	967
14	325	707	652	-176	187	89	713	683	1,036
15	723	633	686	221	110	100	934	793	1,136
16	616	544	712	113	18	124	1,047	811	1,260
17	582	674	685	77	145	96	1,124	956	1,356
18	298	355	663	-208	-177	73	916	779	1,429
19	658	469	538	151	-66	-52	1,087	713	1,377
20	606	455	411	98	-83	-180	1,165	630	1,197
Decade departure							452	559	552
21	134	510	714	-375	-31	123	790	599	1,320
22	462	743	512	-48	200	-79	742	799	1,241
23	416	705	580	-95	160	-11	647	959	1,230
24	616	339	432	104	-208	-158	751	751	1,072
25	114	435	719	-399	-114	129	352	637	1,301
26	(*)	461	693		-88	105		519	1,306
27	(*)	288	697		-260	111		289	1,417
28	(*)	585	488		37	-96		326	1,321
29	(*)	563	78		16	-504		342	817
30	(*)	253	757		-294	177		48	994
31									
Decade departure								-582	-203
Excess or deficiency calories since first of year. (per cent.)							-592	+678	+1,499
							-0.9	+1.0	+2.1

* Register undergoing repairs.

CORRIGENDUM.

May 1918, page 208.

Table 1, Santa Fe, N. Mex., last line, "+0.12" should read "-0.12".

A SOUTH PARHELION OBSERVED MAY 1, 1918, AT FRUITA, COLO.

By J. B. WILLSEA, Cooperative Observer.

[Dated: Fruta, Colo., July 2, 1918.]

On May 1, 1918, a south parhelion was seen at this place from 9:15 to 10:48 a. m. (At 10:51 it had vanished.) When last seen it appeared to be about $3\frac{1}{2}$ degrees from the middle of the ring of the accompanying halo. Its disappearance was gradual and no change in the density or other appearance of the cirrus haze was discernible.

NOTE.—Fruta is on the western slope of the Rocky Mountains at an elevation of nearly 1 mile above sea level. Its latitude and longitude are about $39^{\circ} 10'$ north and $108^{\circ} 45'$ west, respectively. The times given are 90th meridian time or, in other words, they are expressed in what is generally known as "summer time." From these data it has been possible to compute the altitude of the sun at the time of disappearance of the parhelion, and the result gives $50^{\circ} 08'$. This description by Mr. Willsea is, therefore, of considerable interest and importance, confirming as it does other observations of the altitude at which parhelia disappear. (See "The Different Forms of Halos and their Observation" by Besson.)¹ In this case the parhelion gradually diminished in brilliancy and had entirely disappeared when the Sun had reached an altitude between 50 and 51 degrees, although no change in the density of the cirrus clouds was apparent.—W. R. Gregg.

LUNAR RAINBOW OF JUNE 24, 1918, AT SALINA, KANS.

By WALTER A. JONES, Cooperative Observer.

I first noticed this phenomenon about 10:15 p. m. and it lasted until 10:40 p. m. (local summer time). The moon was shining brightly in the southeast as a rain cloud approached from the northwest. This cloud was thick and black, with the rain falling gently, and made an ideal setting for the rainbow. The four colors, red, orange, yellow, and green, were easily discernible, and I thought I could distinguish the blue, but it blended with the color of the cloud so closely I could not be certain. Only about three-fourths of the arc was complete on account of the cloud not being high enough. The highest part of the rainbow was about 40° above the horizon.

SOLAR HALO PHENOMENA OBSERVED AT SANTA FE, N. MEX., JUNE 25, 1918.

By CHARLES E. LINNEY, Meteorologist.

[Dated: Weather Bureau Office, Santa Fe, N. Mex., June 25, 1918.]

A rather unusual and beautiful display of halo occurred at this station at 10:25 a. m., 105th meridian time, June 25, 1918. Fine cirrus clouds were passing eastward in rather close formation near the sun, but widely separated farther eastward. At a distance of 22 to 25

¹ MONTHLY WEATHER REVIEW, July, 1914, 42: 438.